Background
The rod cluster control assembly (RCCA) provides required reactivity worth, maintains geometric configuration for expected duty, and maintains continuous free movement capability. With respect to these functional requirements, some plants have reported instances of clad wear and hairline tip cracks and swelling on their RCCAs. Although the reported instances have not affected the functional requirements of the RCCAs, some utilities have repositioned certain RCCAs to extend their useful life. Radiochemistry measurements can indicate the likelihood of some RCCA cladding wear through, but to develop a plant-specific process to manage RCCA wear, data derived from an on-site inspection are necessary.

Actual on-site inspection is also necessary since the position of the RCCA in the core does not correlate to the amount of wear reported.

Description
Westinghouse performs the examination by lowering an RCCA through the guide fixture that houses the eddy current coil assemblies. A multi-frequency, digital data acquisition and analysis system located on the operating deck of the spent fuel pool processes the eddy current signals. A portable change tool lowers and raises the RCCA.

The 17x17 fixture contains six transducer ring assemblies, the 15x15 fixture contains five transducer ring assemblies, and the 14x14 fixture contains four transducer ring assemblies. The encircling coils gather data as the RCCA is lowered into the fixture. From the data, the rodlet with the most severe wear (in terms of cross sectional area worn/missing) is selected for profilometry examination using eight ultrasonic testing (UT) transducers in two ring assemblies. The coils gather data as the RCCA is raised out of the fixture.

The operator lifts the portable change tool (with the RCCA in it) off the fixture, rotates it 90 degrees, and lowers it onto the fixture again. The process is repeated, including the lift, rotate 90 degrees, lower, data gathering routines, until the eddy current examination is complete on all rodlets (14x14 has 16 rodlets, 15x15 has 20 rodlets, and 17x17 has 24 rodlets).

The typical procedure for inspecting an RCCA is:

1. The portable change tool (suspended from the bridge crane) picks up the RCCA.
2. Pins on the change tool engage with the guide fixture with a surface on top that simulates the top nozzle of a fuel assembly.
3. The change tool continuously lowers the RCCA while the electronic equipment records the eddy current signals from five of the 20 (15x15) rodlets, or six of the 24 (17x17) rodlets.
4. An analyst examines signal traces and determines the location of the largest scar and possible cracks. The analyst then selects the rodlet with the most severe wear scar for closer examination with two UT transducer rings.
5. The operator raises the RCCA and examines the identified rodlet selected using pancake coils.
6. After completing the first down-and-up excursion, the operator rotates the RCCA and changes the tool by 90 degrees to examine the next five or six rodlets.

The operator repeats the above steps until all rods are inspected.
**Benefits**

Westinghouse developed an eddy current measurement system to obtain dimensional data on reactor control rods. The system obtains cross-sectional area and profilometry data to determine the use of the RCCAs in future cycles.

**Deliverables**

Westinghouse prepares procedures and provides personnel necessary to effectively complete RCCA inspection activities. After completing site inspection activities, a final report summarizing the wear analysis evaluation and identifying recommendations to extend the useful life of the RCCAs is provided on an optional basis.